

Description

This invention relates to golf club heads.

This invention relates generally to controlled balance of golf club heads, as for example static and/or dynamic balance; and more particularly it concerns provision of selective local integral weighting of golf club heads such as metal woods to control or achieve desired balance of a head or different heads, as in a set of metal wood golf clubs. The invention has particular reference to golf club heads wherein shallow cavities are provided in the head bottom wall, between a medial ridge and the head heel and toe, although the invention is not limited to heads of that configuration.

Proper balancing of golf clubs, and particularly golf club heads, to meet the needs of golfers having different stances and/or arm or shaft swing characteristics, as for a selected shaft connected to the head, is a highly desirable and important objective. There is need for an improved golf club head configuration that will achieve this objective, and particularly for golf club heads in a set, wherein the different numbered heads are selectively configured or tailored to meet the golfer's needs.

Embodiments of the invention provide a golf club head configuration, and multiple head selective configurations, that can meet the above needs of different golfers.

The present invention is as claimed in the claims.

An improved head of one embodiment of the invention comprises a metal shell having toe and heel portions, a front wall defining a forward facing ball-striking face, and top and bottom walls, the bottom wall being metallic, the bottom wall having at least one local zone of relatively greater thickness, remaining extent of the bottom wall having thickness substantially less than said relatively greater thickness of the local zone. Such a local zone of increased thickness shifts the head center of gravity in accordance with its position and to the player's advantage, as can be determined by try-out of the club.

As will be seen, the major extent of the bottom wall and the thicker local zone typically may consist of a one-piece casting, so that no separate attachment of a weight to the bottom wall is required; also, the local zone is typically at least about twice as thick as the thickness of the major areal extent of the bottom wall. The areal size of the thicker local zone may vary as from about 1.6 cm² (1/4 square inch) to about 6.5 cm² (1 square inch). The thickness of the local zone typically may exceed 0.381 cm (.150 inch), whereas the thickness of the remainder of the bottom wall may be less than 0.152 cm (.060 inch).

The head bottom wall may have a medial ridge which projects downwardly, and the bottom wall forming two shallow recesses, one recess between the ridge and said heel portion, and the other recess between the ridge and said toe portion. The local zone of increased thickness is then typically associated with the ridge and/

or one or both recesses. Examples of such a head bottom wall configuration with a ridge and recesses but no local zone of increased thickness are described in U.S. Patent 5,301,945 and in U.S. Patent application Serial No. 08/173,389, incorporated herein by reference. The location of the local zone of increased thickness at the wall portion forming the bottom ridge, or at the wall portion forming one of the shallow recesses, of the present invention has the further advantage that such wall portion or portions are thereby strengthened, to resist shock loading imposed by impact of the bottom wall with a hard ground surface, or imposed as a result of front wall striking of a golf ball, at high velocity.

As will be appreciated, the local zone of increased wall thickness may be provided on one or more club head walls other than the bottom wall; and the bottom wall need not have the ridge and recess configuration referred to, but may have other configurations, which may be undulating, in which event the location of the local zone of greater thickness at or near the undulation tends to strengthen the undulating wall as against shock loading. In any event, the local zone of increased thickness will, in general, shift the head centre of gravity relative to what or where it would otherwise be in the absence of that local zone.

Finally, and as will be seen, the provision of variably selectively locally weighted heads, as described, as in a set of clubs, enables the golfer to select each club head in his set to have a differentially shifted center of gravity best suited for his swing and stance characteristics, for each particular club in his set. Such a set may include two or more of the following, wherein local selectively thickened wall zones are incorporated:

- a) a metal wood having a front face inclined at approximately 9° from vertical,
- b) a metal wood having a front face inclined at approximately 11° from vertical,
- c) a metal 2 wood,
- d) a metal 4 wood,
- e) a metal 5 wood.

A still further object is to provide an improved golf club head, and method of forming same, to incorporate improvements in construction, mode of operation and results, as referred to.

These and other objects and advantages of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following specification and drawings, in which:

Fig. 1 is a front elevational view of a known golf club head into which the invention may be incorporated; Fig. 2 is a plan view of the bottom of the Fig. 1 head; Fig. 3 is an elevational view of the toe end of the Fig. 1 head; Fig. 4 is an elevational view of the heel end of the Fig. 1 head;

Fig. 5 is an elevation taken in section on lines 5-5 of Fig. 2 and showing a local zone of increased wall thickness at a bottom wall ridge, in accordance with the invention;

Fig. 6 is an elevation taken in section on lines 6-6 of Fig. 2;

Fig. 7 is an elevation taken in section on lines 7-7 of Fig. 5;

Fig. 8 is an elevation taken in section on lines 7-7 of Fig. 5;

Fig. 9 is a perspective view showing the bottom, rear, and heel end of the Fig. 1 club head;

Fig. 10 is a perspective view showing the top, front and toe regions of a known golf club driver head having 9° front face inclination and into which the invention may be incorporated;

Fig. 11 is a top plan view of the Fig. 10 head;

Fig. 12 is a front face elevation view of the Fig. 10 head;

Fig. 13 is a bottom plan view of the Fig. 10 head;

Fig. 14 is a toe end elevation view of the Fig. 10 head;

Fig. 15 is a heel end elevation view of the Fig. 10 head;

Fig. 16 is a rear elevation view of the Fig. 10 head;

Fig. 17 is a fragmentary section corresponding to the full section as seen in Fig. 5, and showing a local zone of increased thickness located at the center of the bottom wall ridge of a metal wood head;

Fig. 17a is a fragmentary view taken in front to rear section on lines 17a-17a of Fig. 17;

Figs. 18 and 19 are views like Fig. 17, but showing the local zone of increased thickness shifted forwardly and rearwardly, respectively;

Fig. 20 is a view like Fig. 17, but showing the local zone of increased thickness shifted laterally to lie at least in part on the bottom wall portion that forms one concave recess (toward the toe);

Fig. 21 is a section like Fig. 17, and taken on lines 21-21 of Fig. 20;

Figs. 22 and 23 are views like Fig. 21, but showing the local zone of increased thickness shifted forwardly and rearwardly, respectively;

Fig. 24 is a view like Fig. 20, but showing the local zone of increased thickness shifted further laterally toward the toe, to lie wholly on the bottom wall portion that forms said one concave recess;

Fig. 25 is a section like Fig. 21, and taken on lines 25-25 of Fig. 24;

Figs. 26 and 27 are views like Fig. 25, but showing the local zone of increased thickness shifted forwardly and rearwardly, respectively;

Fig. 28 is a view like Fig. 17, but shows the local zone of increased thickness shifted laterally to lie at least in part on the bottom wall portion that forms another concave recess (toward the heel);

Fig. 29 is a section like Fig. 17a, and taken on lines 29-29 of Fig. 28;

Figs. 30 and 31 are views like Fig. 29, but showing the local zone of increased thickness shifted forwardly and rearwardly, respectively;

Fig. 32 is a view like Fig. 28, but showing the local zone of increased thickness shifted further laterally toward the heel of the head, to lie wholly on the bottom wall portion that forms said other concave recess;

Fig. 33 is a section taken on lines 33-33 of Fig. 32; Figs. 34 and 35 are views like Fig. 33, but showing the local zone of increased thickness shifted forwardly and rearwardly, respectively;

Fig. 36 is a view like that of Fig. 6, and showing the local zone of increased thickness located at the rear wall of a head;

Fig. 37 is a view like that of Fig. 6, and showing the local zone of increased thickness located at the upper wall of a head;

Fig. 38 is an enlarged section;

Fig. 39(a) is a fragmentary section taken through a golf club head front wall and through a sole plate, showing selective weighting of the head in closely spaced relation to the rear side of the front wall;

Fig. 39(b) is a section taken on lines 39(b)-39(b) of Fig. 39(a);

Fig. 40 is a right front to left rear top perspective view of a sole plate embodying frontal selective weighting of the type disclosed in Figs. 39(a) and 39(b);

Fig. 41 is a rear-to-front top perspective view taken on lines 41-41 of Fig. 40;

Fig. 42 is a left side elevation taken on lines 42-42 of Fig. 40; and

Fig. 43 is a bottom plan view taken on lines 43-43 of Fig. 42.

Referring now to Figs. 1-5, a golf club 10, of known outer configuration (see U.S. Patent 5,301,945) is shown. The present invention is applied to that head, as better shown in Fig. 5, and Figs. 22-24. The club 10 includes a shaft 12 (only the lower portion of which is shown), which is attached to a head 14. The head 14 is in the configuration of a "wood" club, although it is made of metal.

As shown in Figs. 5-8, the head comprises a hollow, metal shell 16, and may consist of stainless steel; and it may be fabricated by the "lost wax" casting method that is well-known in the art. The shell 16 may for example be formed in two pieces: a main portion 20 and a sole plate 22, that is peripherally welded to the main portion 20.

The main shell portion 20 has a top surface 24, a rear surface 26, and a ball-striking surface or face 28 opposite the rear surface 26. The face 28 is angled with respect to the vertical with a specified "pitch" that is determined by the type of club and the amount of loft desired. The end portion of the head 14 proximate the shaft 12 is commonly termed the "heel" 30, while the end por-

tion opposite the heel **30** is termed the "toe" **32**. As shown in Fig. 2, the face **28** is typically curved from the heel **30** to the toe **32**.

Figs. 5 and 6 show incorporation of a weight **300** on the sole plate, at the head interior. Specifically, the weight **300** is shown incorporated with the inner side of downwardly convex ridge **60** that extends forwardly and rearwardly, as seen in Fig. 2. Such weighting will be described in detail in Figs. 22-24, as well as in Figs. 25-42.

To complete the description of Figs. 5-9, shell **16** has a heel wall **30a**, a hollow tube **36** having an upper opening **38** in top surface **24**, and a lower opening **40** in head bottom surface as shown. If foam material is to be introduced into the head interior, it may be passed through an orifice **42** in tube **36**. Tabs **36** receive shaft **12**, to which it is suitably connected. See also lip **43**, ring **50**, and striations **44**. The head top surface is tangent to horizontal plane **200**. The lower end **52** of shaft **12** is plugged at **46**.

As seen in Fig. 2, shallow downwardly concave recesses are formed at **162** and **164** by the sole plate, at opposite sides of the ridge. Recess **162** merges with one side of the ridge and has peripheral extent indicated at **162a**, **162b**, **162c** and **162d**. Recess **164** merges with the opposite side of the ridge **60** and has peripheral extent indicated at **164a**, **164b**, **164c** and **164d**. Note recess medial surface extents **162'** and **164'**. The recess depths are indicated at d_1 and d_2 in Figs. 7 and 8. Ridge **60** diverges forwardly at **60a** and **60b**, and rearwardly toward rear bevel **56**. The latter is bounded by lines **56a**, **58**, and cusps at **162a** and **164a**. See bevel angle **A** in Fig. 4. See also the weight **300** in Fig. 2, located medially along the ridge length.

The head bottom wall can be formed or cast integrally with the remainder of the head, if desired, i.e., it need not be separately formed and later welded to a rim defined by a separately cast head. Such forming may be by a casting or molding process employing metallic or non-metallic material.

The bottom wall and/or the rest of the head can be made of materials other than metal. Typical metallic materials include steel, steel alloy, titanium, and titanium alloy.

Referring now to Figs. 10-16, the metal wood head **200** shown has a front face **201** with inclination β from vertical (see Fig. 14) which is 9° , i.e., the wood is a driver.

The internal construction of the head **200** may, if desired, be the same as that of the Fig. 1-9 head, as respects selective weighting as described herein.

Referring to Fig. 13, the head **200** is further characterized by the following:

- i) the dished recesses **162'** and **164'** are located in substantially mirror imaged position with respect to a forwardly extending, vertical plane **400** bisecting the ridge **60a'**,
- ii) the convergent rearward terminus of dished re-

cess rearwardmost extent **162d'** is intersected by a cusp **210** defined by surface or bevel **56a**; and the convergent rearward terminus of dished recess rearwardmost extent **164d'** is intersected by a cusp **211** also defined by bevel **56a**. These cusps are further defined by intersection of the bevel with head rounded outer bottom surface **213** and intersection of the bevel with the ridge rearwardmost and rearwardmost divergent extents, as shown. The cusps **210** and **211** are substantially equidistant from the head front face **201**, whereby the bevel is centered between the rearwardmost extents **162d'** and **164d'** of the recesses,

iii) plane **400** also bisects the bevel so that cusps **210** and **211** are located at substantially equal distances from the planet and the plane **400** also intersects the rearwardmost extent **213a** of the head. Note the ridge **60a** is divergent, forwardly.

Note the selective locations of an internal weight as described herein, and as designated in broken lines at **300**. See also Figs. 5, 17 and 17a.

In Figs. 5, 17 and 17a, the head cast metallic bottom wall, in this core sole plate **22**, has a local zone **300** of relatively greater metallic thickness t_1 , associated with ridge **60**, which is downwardly convex. The major extent of the bottom wall **22** has thickness as at t_2 substantially less than such thickness t_1 . Thicker local zone **300** bulges upwardly toward the interior **301** of the cast metallic head, to form a plateau, and is shown to have lateral width w_1 and longitudinal length l_1 . The thickness t_1 , is typically at least about twice the thickness t_2 , and t_1 typically exceeds 0.38 cm (.150 inch), whereas the thickness t_2 of the major extent of the bottom wall is normally less than 0.152 cm (.060 inch). In an example, the thicknesses are as follows:

$$0.381 < t_1 < 1.27 \text{ cm } (.150 < t_1 < .500 \text{ inch})$$

$$0.0762 < t_2 < 0.127 \text{ cm } (.030 < t_2 < .050 \text{ inch})$$

Note that the local zone **300** provides selectively located increased weighting, so that its position influences the location of the head center of gravity relative to the head heel and toe, the head top and bottom, and the head forward face, and rear wall. Zone **300** may be at the approximate center of the bottom wall; and cast integrally with the bottom wall, or the sole plate **22**.

In Fig. 18, the local zone indicated at **300'** is like zone **300**, but is shifted forwardly along the interior of the ridge, to shift the head center of gravity forwardly. In Fig. 19 the local zone is indicated at **300''** and is like zone **300**, but is shifted rearwardly, along the interior of the ridge, to shift the head center of gravity rearwardly.

In Figs. 20 and 21 the local zone **310** is like zone **300**, but shifted toward the toe of the head; it is located

at least partly above the recessed wall portion **162'** at the toe side of the ridge, to shift the CG toward the toe. In Fig. 22 the local zone **310'** is like zone **310** and laterally in the same position as **310**, but it is shifted forwardly, and in Fig. 23 zone **310"** is shifted rearwardly.

In Figs. 24 and 25, local zone **320** is like zone **300**, but shifted further toward the toe of the head. It is located above the recessed wall portion **162'**, and shifts the CG more toward the toe. In Fig. 26 the local zone **320'** is like zone **320** (and is in the same laterally shifted position as zone **320**) but it is shifted forwardly; and in Fig. 27 zone **320"** is shifted rearwardly, to correspondingly shift the CG rearwardly.

In Figs. 28 and 29, local zone **330** is like zone **300**, but is here shifted toward the heel of the head. It is located at least partly above the recessed wall portion **164'** at the heel side of the ridge, to shift the CG toward the heel. In Fig. 30 the local **330'** is like zone **330**, but is shifted forwardly, and in Fig. 31 corresponding local zone **330"** is shifted rearwardly.

In Figs. 32 and 33, local zone **340** is like zone **330** but shifted further toward the heel of the head. It is located above the second wall portion **164'**, and shifts the CG more toward the heel. In Fig. 34 local zone **340'** is shifted forwardly; and in Fig. 35, corresponding local zone **340"** is shifted rearwardly, to shift the CG rearwardly.

By way of example, trial metal heads bearing a number X (say a 2 wood) would have a selected local thicker zone positioned as in Figs. 17 and 18, 20 and 21, 24 and 25, 28 and 29, and 32 and 33, and a golfer would try out such X heads to determine which are best suited to his stance and swing. If he selected the Figs. 24 and 25 head for best lateral shifted CG, he would then try out the heads of Figs. 26 and 27 for best longitudinal shifted CG. He might then select the X head having local weighting as in Fig. 27, as representing, for him or her, the best "balanced" X head of the group.

The golfer would then repeat this selection from a similar group of X-1 heads, i.e. 1 woods for example; and for a similar group of X+1 heads, i.e. 3 woods. The golfer then can select which weighted head is best "balanced" or suited for him or her, for a series of heads in a set, and purchase or lease such "tailored" heads as representing the set of heads best balanced for him or her. If the golfer's stance, or swing, or selected shaft changes, the matching method can be repeated to arrive at a different set which is up-dated and balanced (statically and dynamically) for the golfer, whereby the golfer's game score can be significantly improved, over time.

More specifically, the method of selecting golf clubs to make up a set would include providing a first group of golf clubs of the same front face "loft" angularity (as for example 3 woods), but whereby the local zones of increased thickness have different selected positions in the heads of the group (as in Figs. 17-33, for example); then swinging those different heads of the first group on

a try-out basis; and then selecting a club of the first group having an apparent best balance for that particular golfer. The best 3-wood would thereby be selected. Next, a second group of golf clubs would be provided, of the same front face angularity different from that of the first group (as for example 2-woods), but wherein the local zones of second thickness again have different selected positions in the heads of the second group (as in Figs. 17-33, for example); then swinging those different heads of the second group on a try-out basis; and then selecting a club of the second group having an apparent best balance for that particular golfer. The best 2-wood would thereby be selected. This process would be repeated for all woods of a complete set.

Fig. 36 shows an alternative formation of a local zone **400**, of increased thickness in the lower rear wall **401** of a metal wood head **402**; and Fig. 37 shows alternative formation of a local zone **410** on the upper wall **411** of a metal wood head **412**.

Fig. 38 shows provision of a local zone of decreased thickness, i.e. a recess or pocket **600** in the metallic bottom wall **601** of a head, instead of a zone of inward thickness as described above. Such a local zone of decreased thickness may be substituted for the zone of increased thickness as referred to in Figs. 17-37. Suitable lightweight filler material **602** may be filled into that recess, to strengthen the wall at that location. One example is epoxide material.

Referring to Figs. 39(a) and 39(b), a head **700**, which may be of the type shown in Figs. 10-16, has a front wall **701** defining a ball-striking face **702**, and a bottom wall **703**. The bottom wall has a local zone **704** of selected thickness characterized in this instance in that it increases in thickness forwardly toward the front wall **701**. See upwardly and leftwardly (frontwardly) ramping upper surface **704a**. The remaining extent, as at **703a** and **703b** of the bottom wall has thickness different from the selected thickness. Also, note the gap or clearance **705** between the front wall **701** and the forward wall **704b** of the body **704**. The shape of the weight body **704** places the head CG closer to the front wall **701**, and to the lower extent thereof, for enhanced ball striking effect.

Note in Fig. 39(b) that the bottom wall **703** diverges laterally oppositely and upwardly, at shallow upward angles, away from a bottom ridge **706** that extends rearwardly, as in Fig. 13. Note that the body **704** increases in thickness laterally, toward the region **704c** vertically above the ridge. Bottom wall **703** also forms downwardly concave surfaces **703d** and **704a**, corresponding to recesses **162'** and **164'** in Fig. 13.

The sole plate **800** in Figs. 40-43 embodies the features as referred to in Figs. 39(a) and 39(b), and corresponding elements bear the same identifying numerals. Note that the sole plate has lateral wings **801** and **802** which diverge upwardly and laterally. See corresponding elements **703a** and **703b** in Fig. 39(b). Body **704** merges with the wings, as with their upper surfaces, as

appears in Fig. 41. The sole plate has a peripheral ledge **804**, which is adapted for weld connection to the looping inner edge 806 of the bottom wall of the head **808**, as seen in Fig. 43. The head periphery is indicated at **809**.

An inner "cut-out" **810** is formed on the sole plate periphery to fit against the corresponding head protruding edges **806a** and **806b**, for weld connection thereto. Sloping lateral faces of the body **804** appear at **804e** and **804f**. Rear upturned beveled surface **811** corresponds to bevel **56a** in Fig. 13.

Claims

1. A golf club head comprising a shell (14) having toe and heel walls (32,30), a front wall (28) defining a forward facing ball-striking face, and top and bottom walls (24,22), at least one of said walls (22) having a local zone (300) of selected thickness, remaining extent of said one wall (22) having thickness different from said selected thickness.
2. The head of claim 1 wherein said major extent of said one wall and said local zone consist of a one-piece metal casting (800).
3. The head of any preceding claim wherein said bottom wall is characterised as having a medial ridge (60) which projects downwardly, and as forming two shallow recesses (162,164), one recess between the ridge and said heel portion, and the other recess between the ridge and said toe portion, said one local zone (300) being associated with at least one of said ridge (160) and said recesses (162,164).
4. The head of any preceding claim wherein said local zone is located rearwardly of said front wall (28).
5. The head of any preceding claim wherein said local zone (300) is of relatively greater thickness and faces interiorly of the head (10), and, optionally, wherein said local zone (300) forms a plateau projecting interiorly of the head (10).
6. A golf club head of any preceding claim comprising a shell having metallic toe, heel, top and bottom walls (32,30,24,22) at least one of said metallic walls having the one local zone and which is of relatively greater thickness, the major extent of said at least one wall having thickness substantially less than said relatively greater thickness, and, optionally, wherein said major extent of said one wall and said local zone (300) consist of a one-piece integral metallic body, in which case, further optionally, wherein said body is a metallic casting.
7. The head of any preceding claim wherein the thickness of said local zone (300) is at least about twice

the thickness of said one wall.

8. The head of any preceding claim wherein either:
 - a) said thickness of said local zone (300) exceeds .150 inch, and said thickness of said major extent of said one wall is less than .060 inch; or
 - b) said thickness of said local zone (300) is between .150 and .250 inch, and said thickness of said major extent of said one wall is between .030 and .050 inch.
9. The head of claim 3 or any one of claims 4 to 9 as dependent on claim 3 said at least one local zone (300) is of increased thickness and is positioned in such relation to said ridge (60) and recesses (162,164) as to shift the head centre of gravity relative to what it would otherwise be in the absence of said local zone (300).
10. A set of golf clubs having heads as defined in any preceding claim, the heads having different front face angularities.
11. The head of any one of claims 1 to 4 wherein said local zone defines a pocket (600) on said one wall (601), and, optionally, including filler (602) material in said pocket (600).
12. The set of golf clubs as defined in any preceding claim, wherein said local zones (300) of increased or decreased thickness have different selected positions in at least certain of the heads of the set.
13. The method of selecting golf clubs to make up a set, each head (10) having a configuration as defined in any preceding claim, which includes providing a first group of golf clubs each as defined in any preceding claim but wherein the local zones (300) have different selected positions in the heads of the group, all heads (10) of the group having the same front face angularity, swinging the different heads of the group on a try-out basis, and selecting a club of the first group having an apparent best balance.
14. The method of claim 13 including providing a second group of golf clubs, each as defined in any preceding claim but wherein the local zones (300) of increased or decreased thickness have different selected positions in the heads (10) of the second group, all heads (10) of the second group having the same front face angularity which is different from the first face angularity of the heads (10) of the first group, swinging the different heads (10) of the second group on a try-out basis, and selecting a club of the second group having an apparent best balance.

15. The method of providing a set of golf clubs for a golfer that includes the steps: wings (801,802) and at upper sides thereof.
- (a) providing multiple groups of golf clubs wherein 5
- (i) the heads (10) of each group are the same except that the locations of the head centres of gravity are different in the heads (10) of each group, 10
- (ii) the heads (10) of different groups have front faces with different angularities,
- (b) and allowing the golfer to swing the clubs of each group and to select a club for each group which is best suited for that golfer. 15
16. The head of any preceding claim wherein said local zone (704) increases in thickness in a direction toward said front wall (701), and, optionally, wherein said local zone terminates, frontwardly, at a gap (705) defined between said front wall (702) and the forwardmost extent of said local zone (704). 20
17. The head of any preceding claim wherein said one wall comprises said bottom wall. 25
18. The head of claim 17 wherein said bottom wall comprise a head sole plate (800) peripherally joined to a looping rim defined by the head (10), and, optionally, wherein said wings (801,802) have downwardly concave lower surfaces. 30
19. The head of claim 18 wherein either: 35
- a) sole plate has laterally spaced wings (801,802) which extend upwardly and laterally oppositely toward the heel and toe walls, and said local zone (704) merges with said wings (801,802), laterally; or 40
- b) wherein said local zone (704) has an upper surface which ramps upwardly toward said front wall, and, optionally, wherein said upper surface (704a) terminates in rearwardly spaced relation from said front wall. 45
20. A sole plate (800), for a golf club head having a front wall (702), comprising a body that increases in thickness in a forward direction over a substantial front dimension of the sole plate (800), and the sole plate (800) having a periphery formed for attachment to the head (10) below the uppermost level of said body, and, optionally, wherein said body (704) has an upper surface (704a) defining a ramp that rises in a direction toward said front wall (701) and/or wherein the sole plate (800) has two laterally spaced wings (801,802) which diverge upwardly and laterally oppositely, said body merging with said 50 55

FIG. 1.

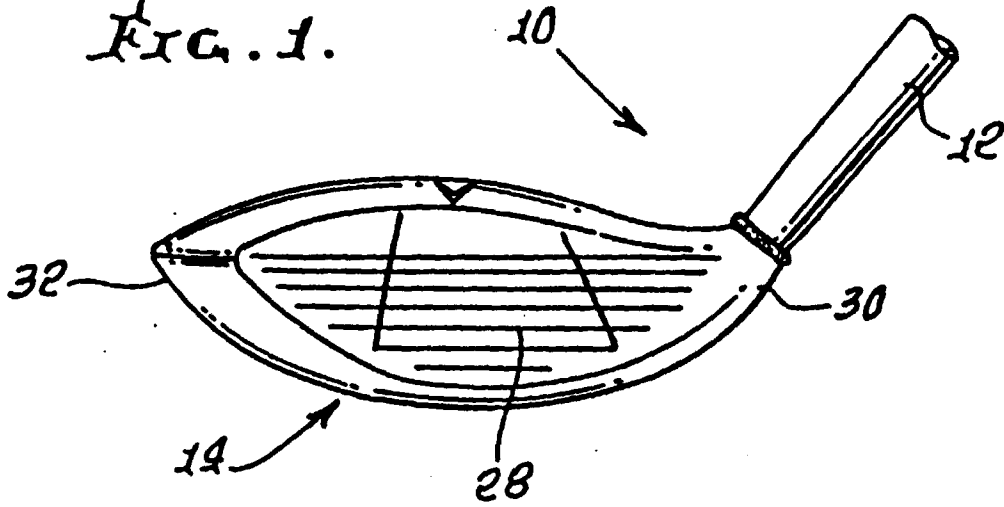


FIG. 2.

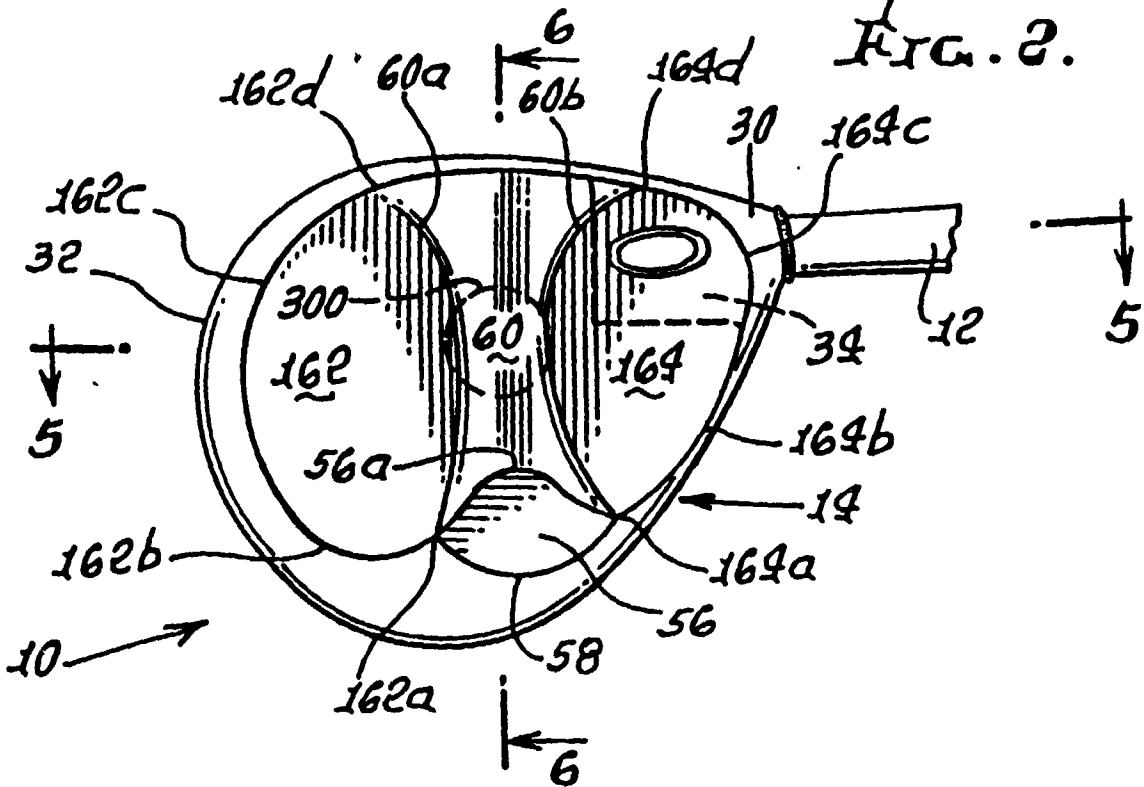


FIG. 6.

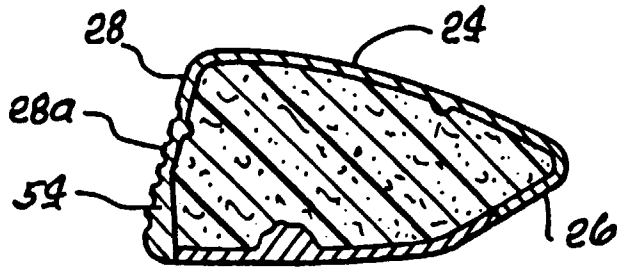


FIG. 7.

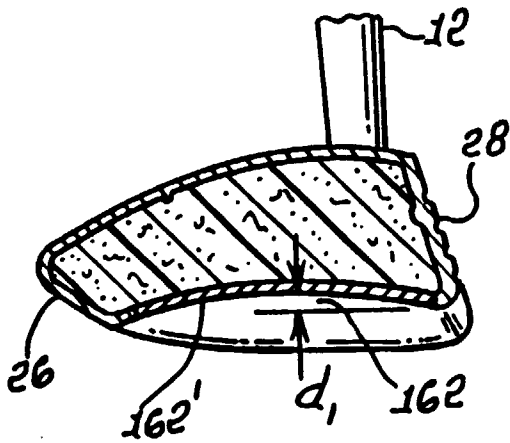


FIG. 8.

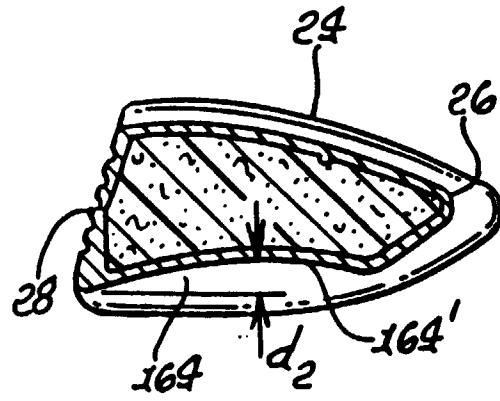
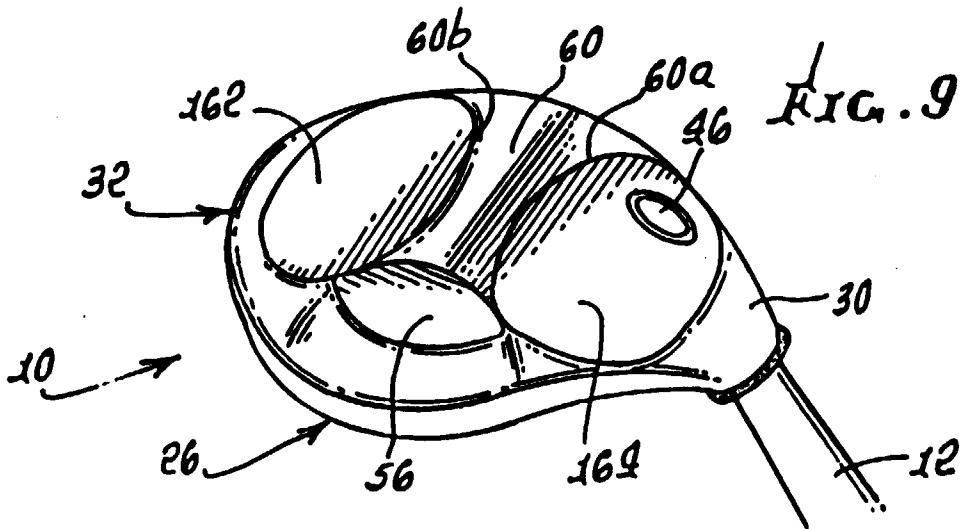
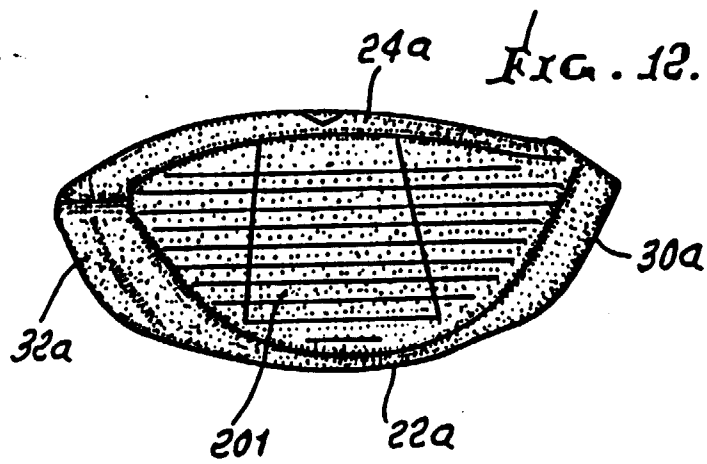
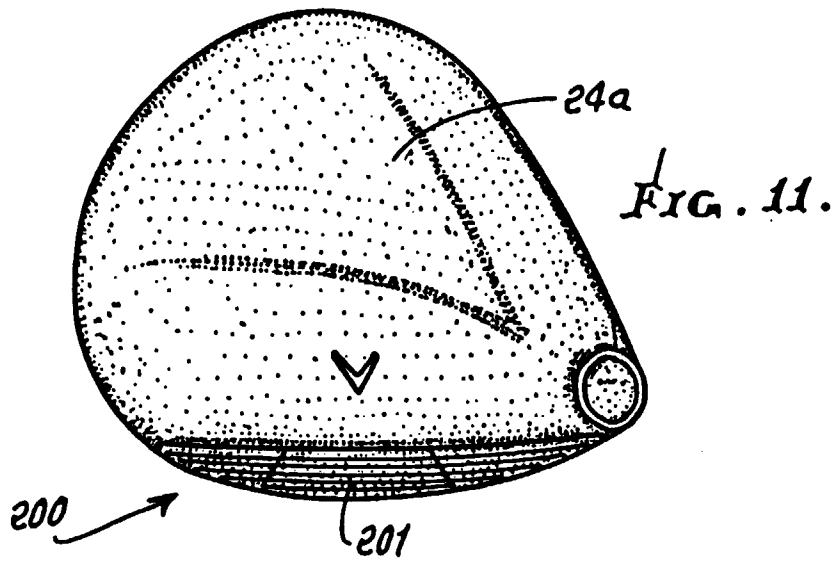
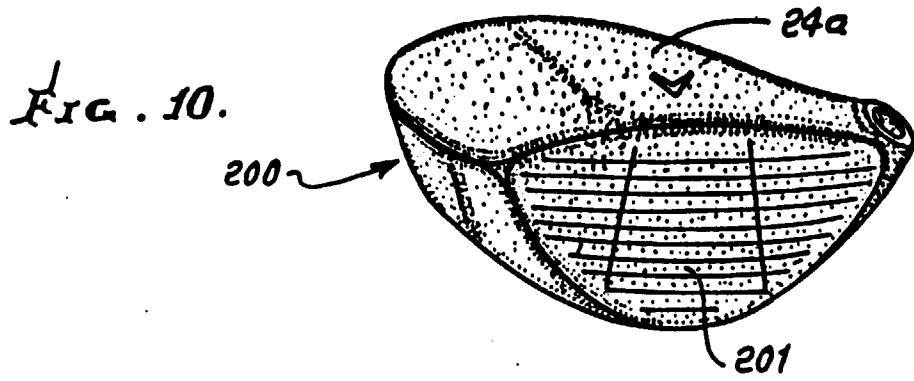


FIG. 9.





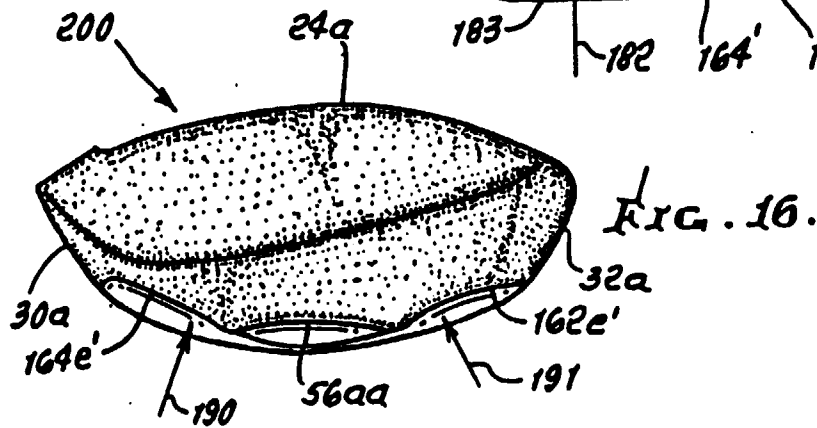
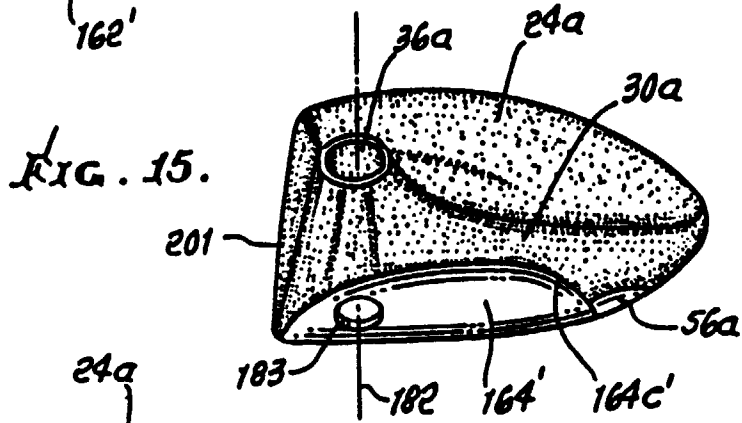
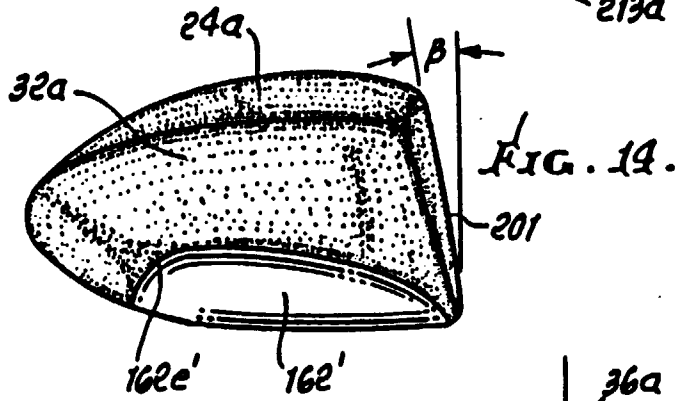
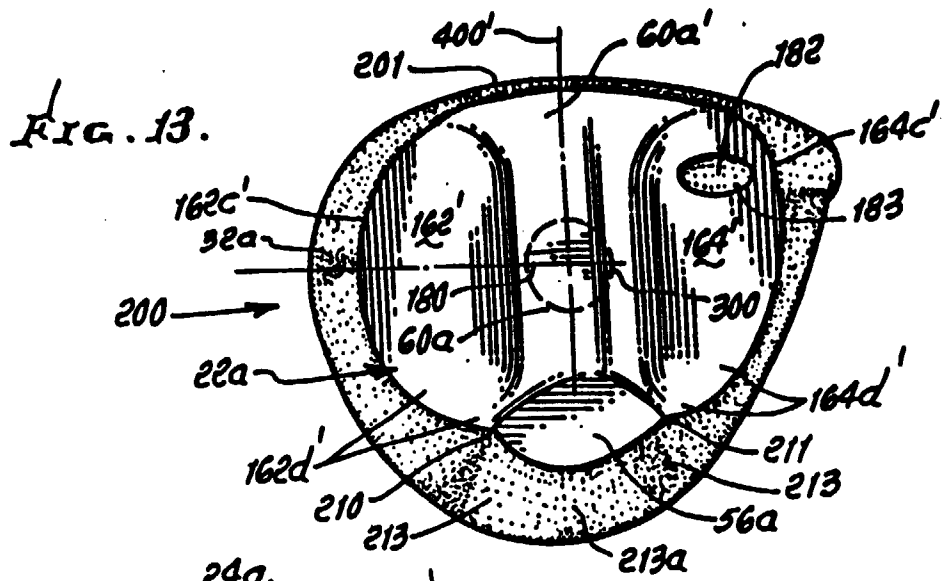


FIG. 17.

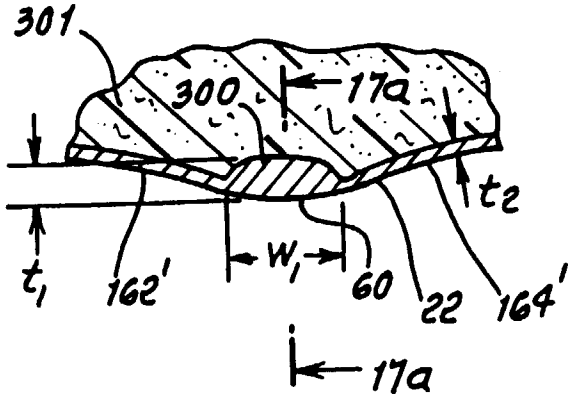


FIG. 19.



FIG. 17a.

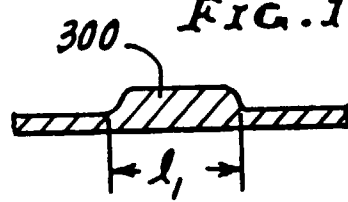


FIG. 18.

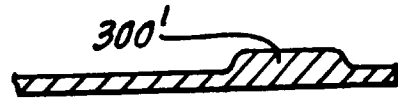


FIG. 20.

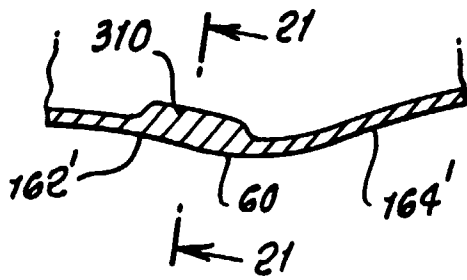


FIG. 23.

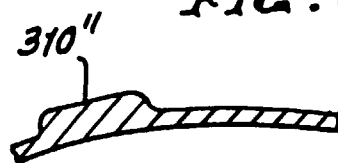


FIG. 21.

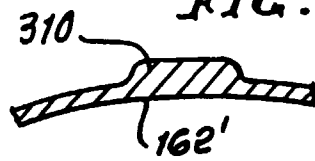


FIG. 22.

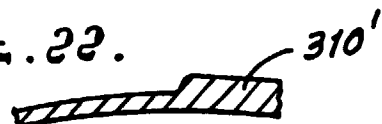


FIG. 24.

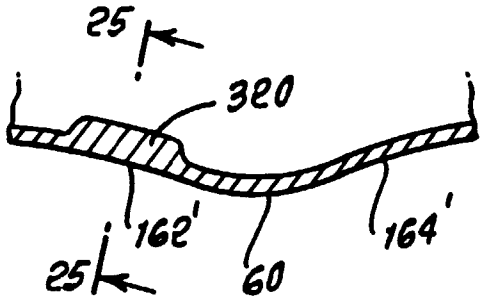


FIG. 27.

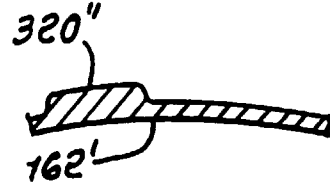


FIG. 25.

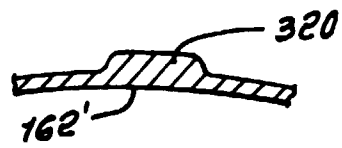


FIG. 26.



FIG. 28.

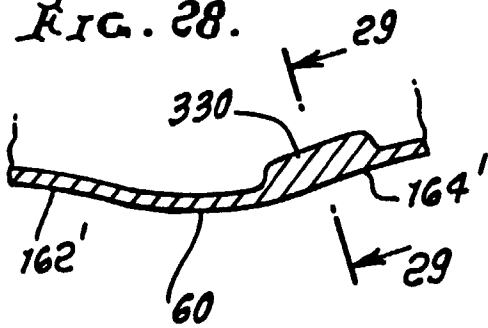


FIG. 31.

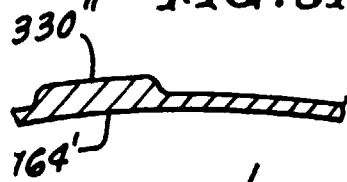


FIG. 29.

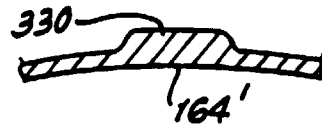
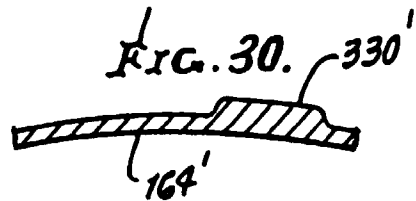


FIG. 30.



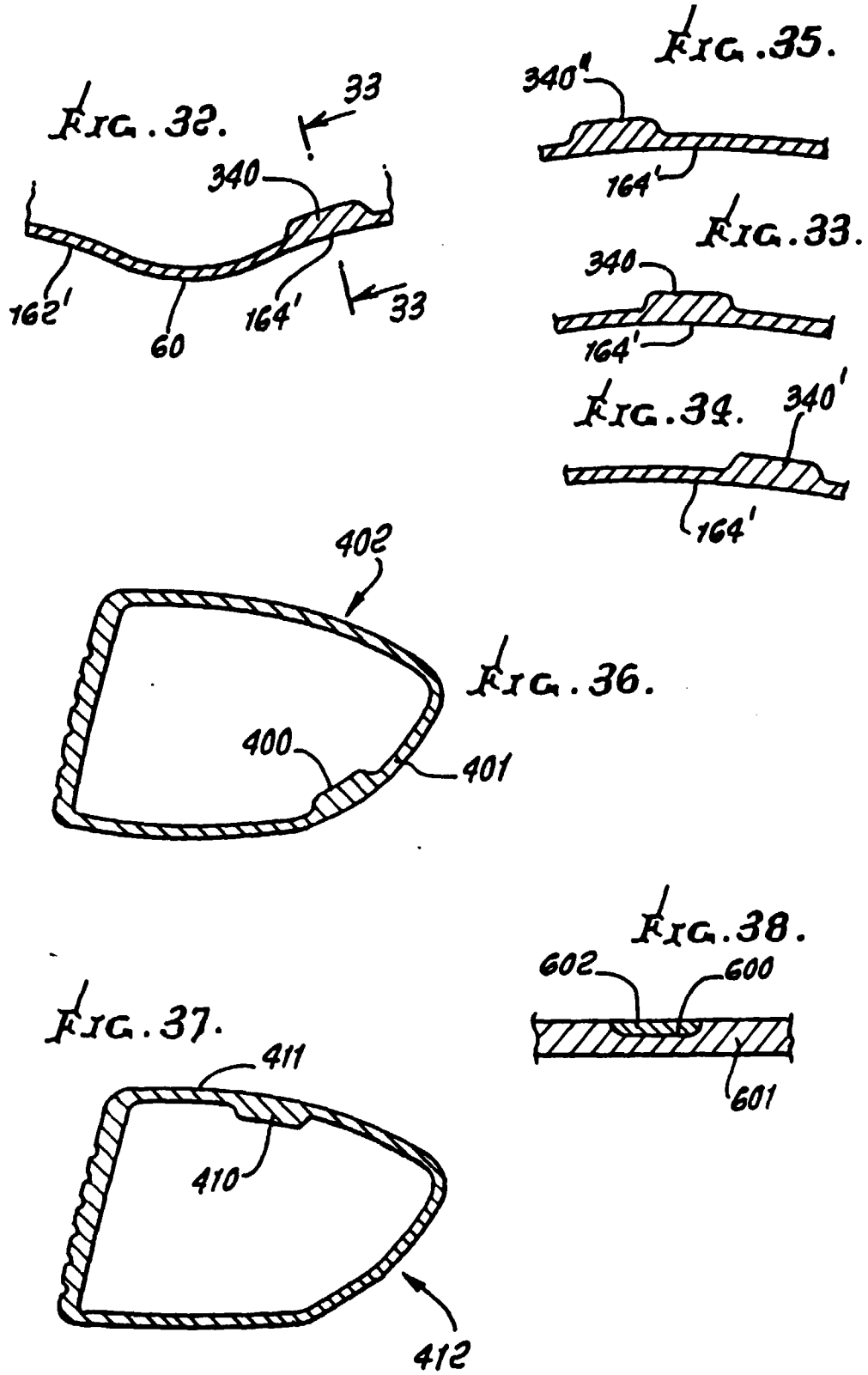


FIG. 39a.

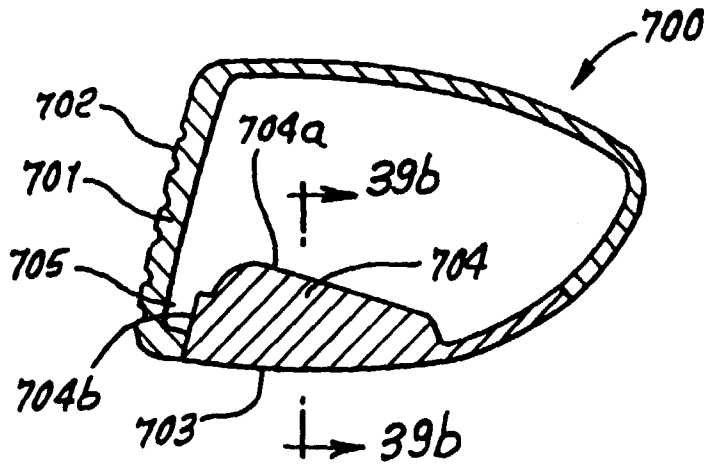


FIG. 39b.

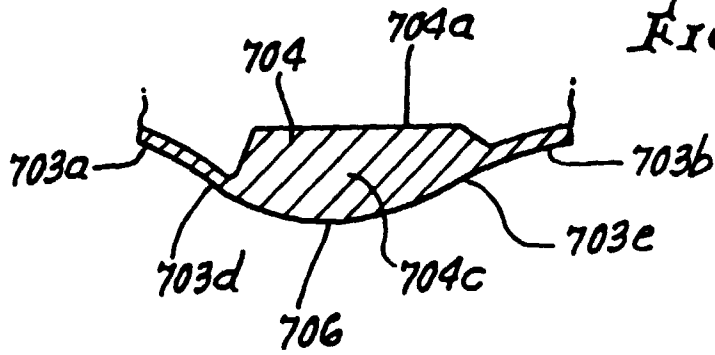


FIG. 40.

